



The THUNDER Campaign Model

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Overview

- **Model Background and General Description**
- **Inputs**
- **Execution**
- **Outputs**



THUNDER

USAF's Premier Campaign Model

Foundation: Service warfighting perspectives converge over the land in a theater of operations



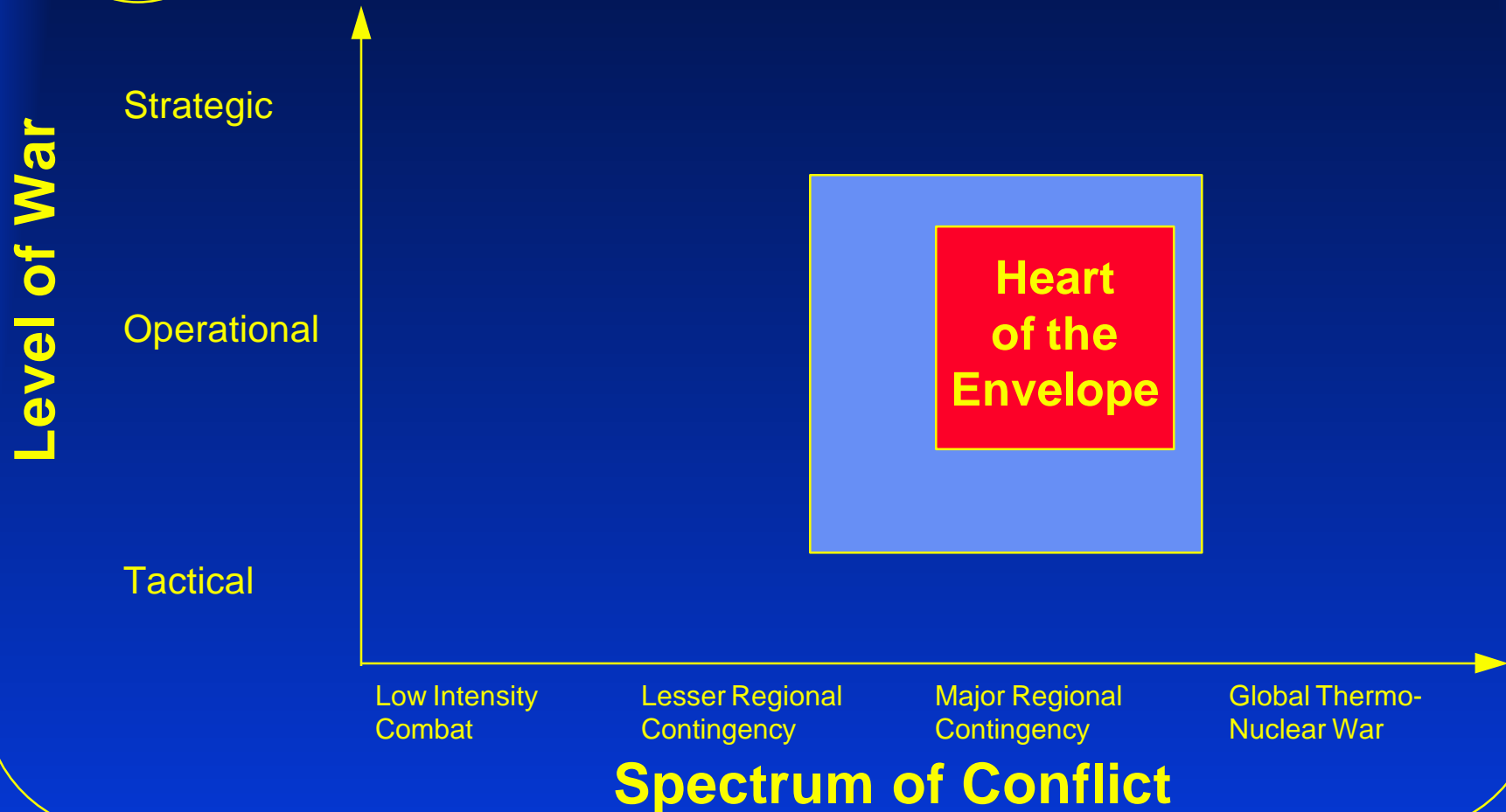


THUNDER--What is it?

- Theater level model
- Stochastic, two-sided, event sequenced
- Conventional air-land warfare; limited naval warfare
 - “Pure” naval tasks such as ASW not modeled
- Written in SIMSCRIPT II.5™
- Runs best on Sun or Silicon Graphics UNIX workstation

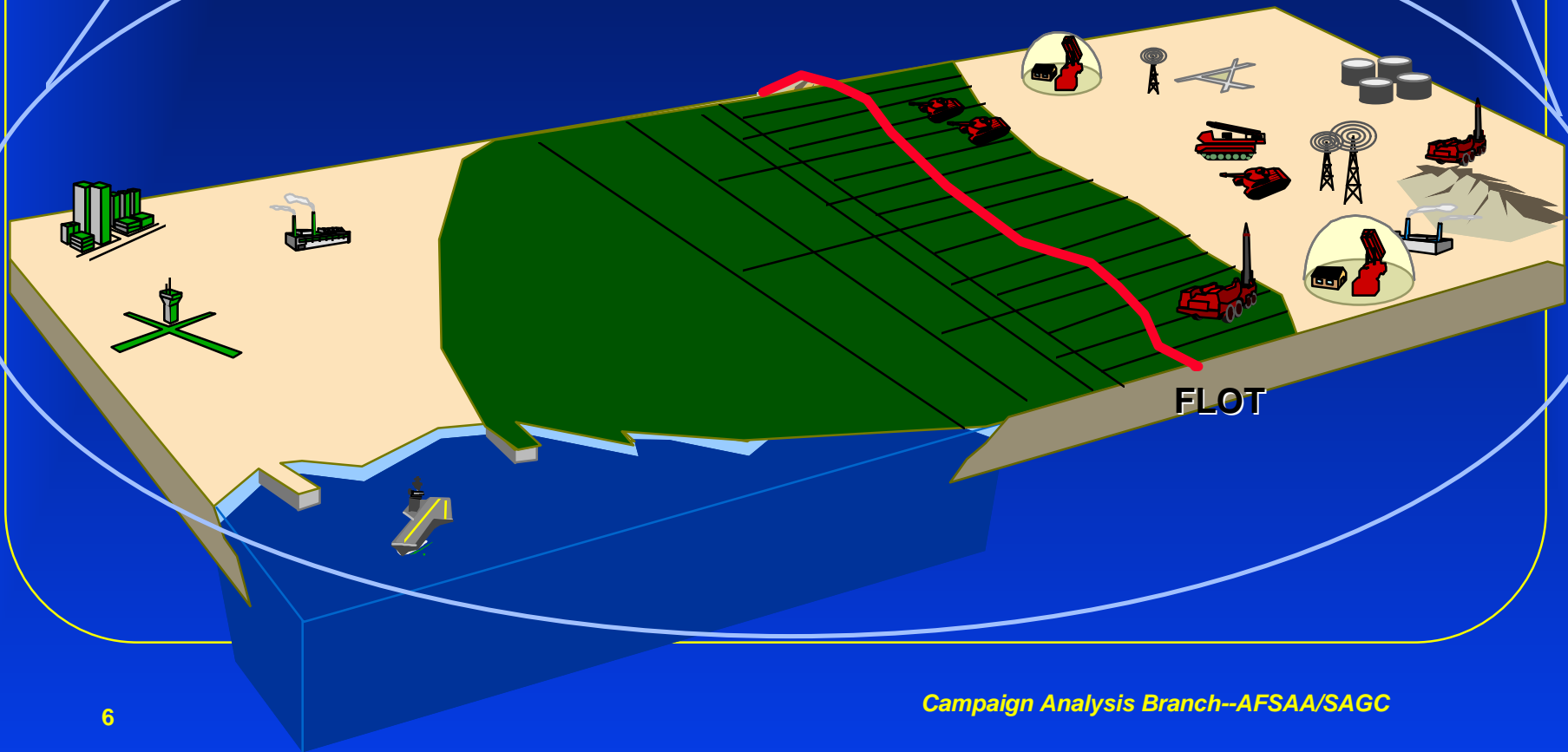


THUNDER Domain





Joint Force Commander's Perspective Modeled





AFM 1-1 Roles and Missions Portrayed in THUNDER

Role

Aerospace Control

Force Application

Force Enhancement

Mission

Counterair

- Offensive
- Defensive
- SEAD
 - Destructive
 - Disruptive

Counterspace

- Offensive
- Defensive

Strategic Attack

Interdiction

Close Air Support

Air Refueling

Electronic Combat

Surveillance and Reconnaissance



HIGH BATTLE

DEEP BATTLE

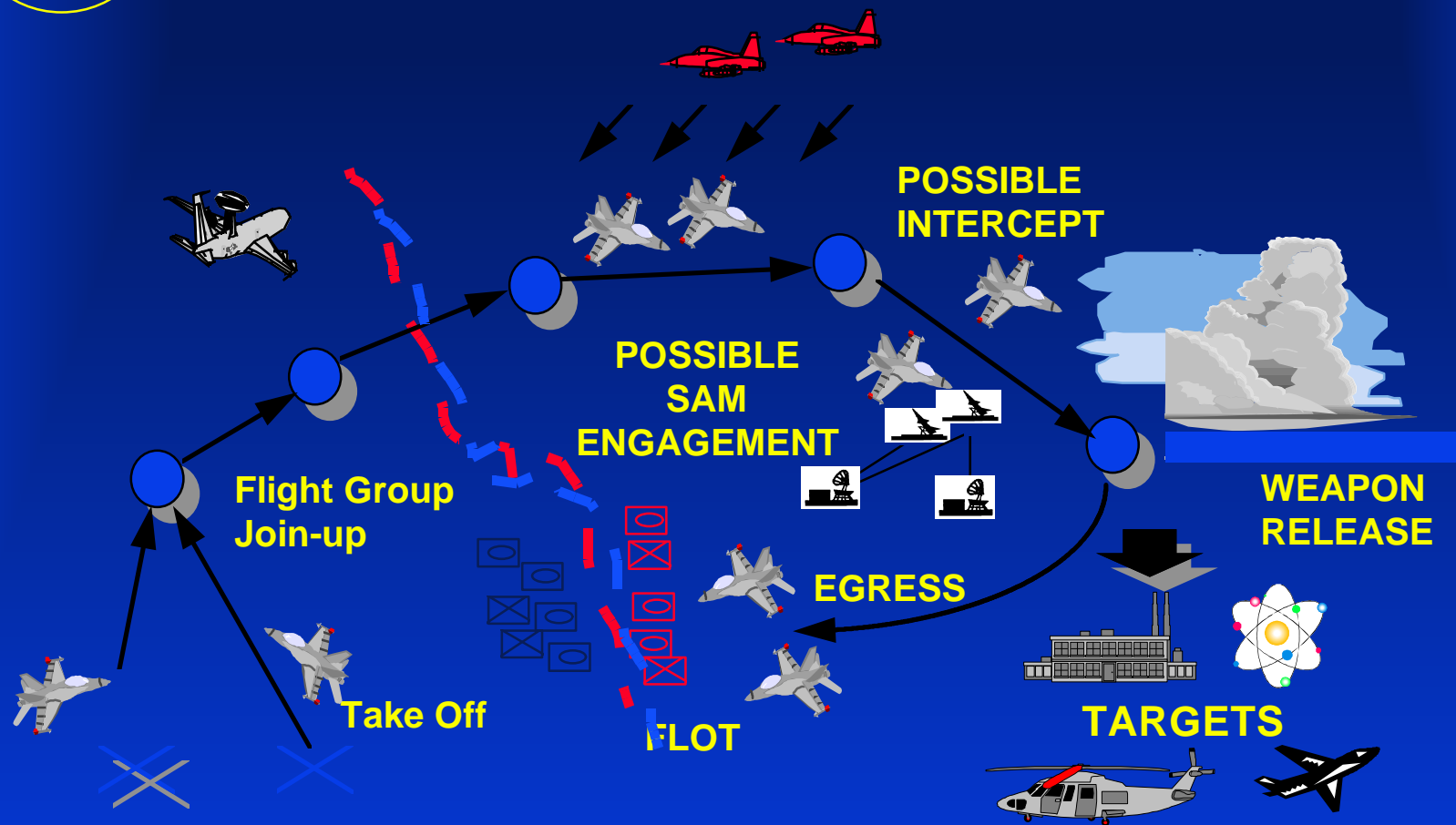
REAR BATTLE

CLOSE BATTLE

SEA BASED AIRPOWER



Representative Mission



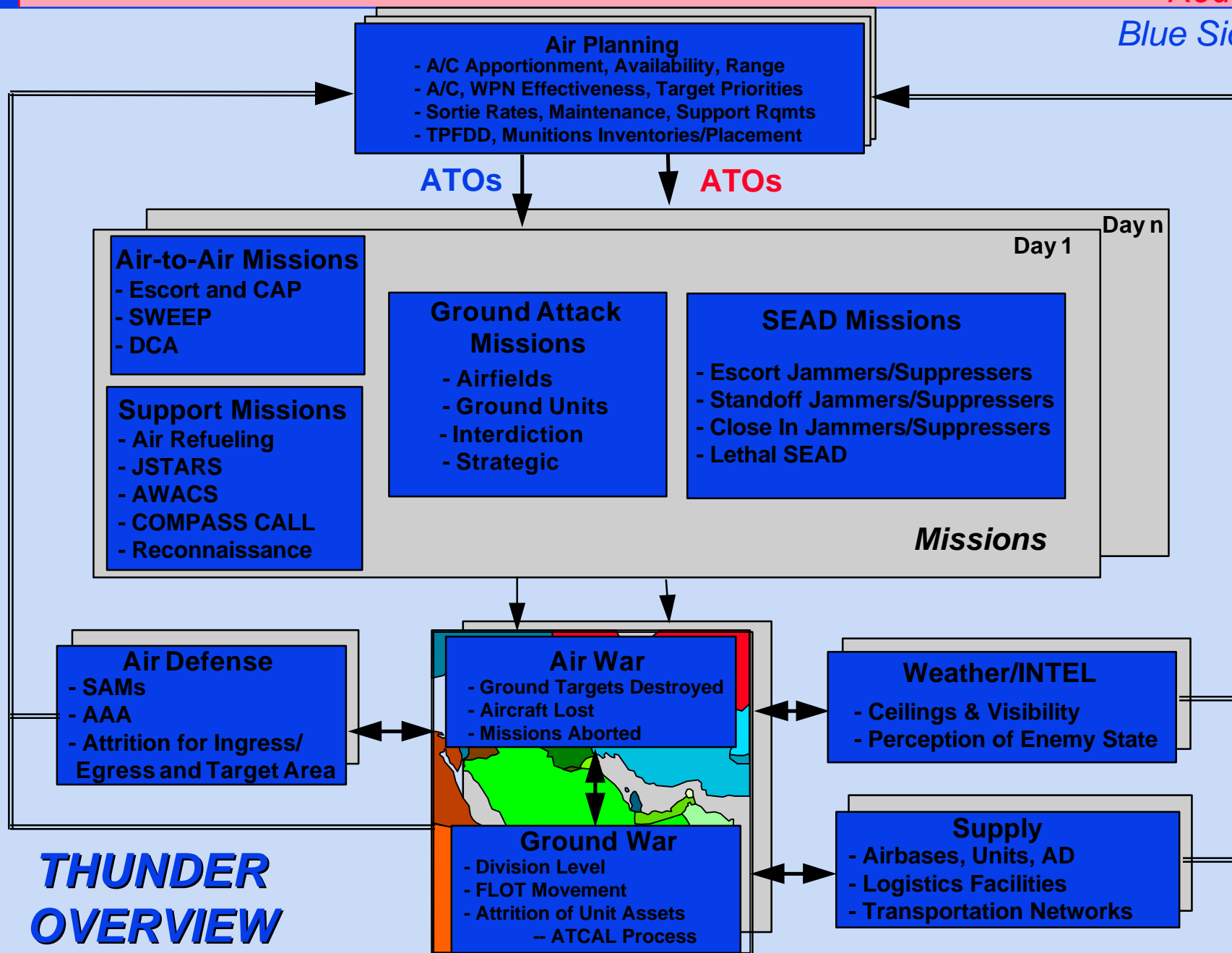


THUNDER Air Tasking Order Generation

- **Sophisticated embedded ATO generation available in THUNDER**
 - Two-sided
 - Manual fragging also possible
- **ATO process follows Joint Doctrine (JPub 3-56.1)**
 - **Apportionment--Input**
 - » Percentage of air power to various types of missions
 - » Normally function of planning command, squadron, mission class, and time
 - **Allocation--Output**
 - » Model determines sorties to be flown by mission and squadron
 - **Distribution--Output**
 - » Distributed sorties to highest priority targets in mission area

Red Side

Blue Side



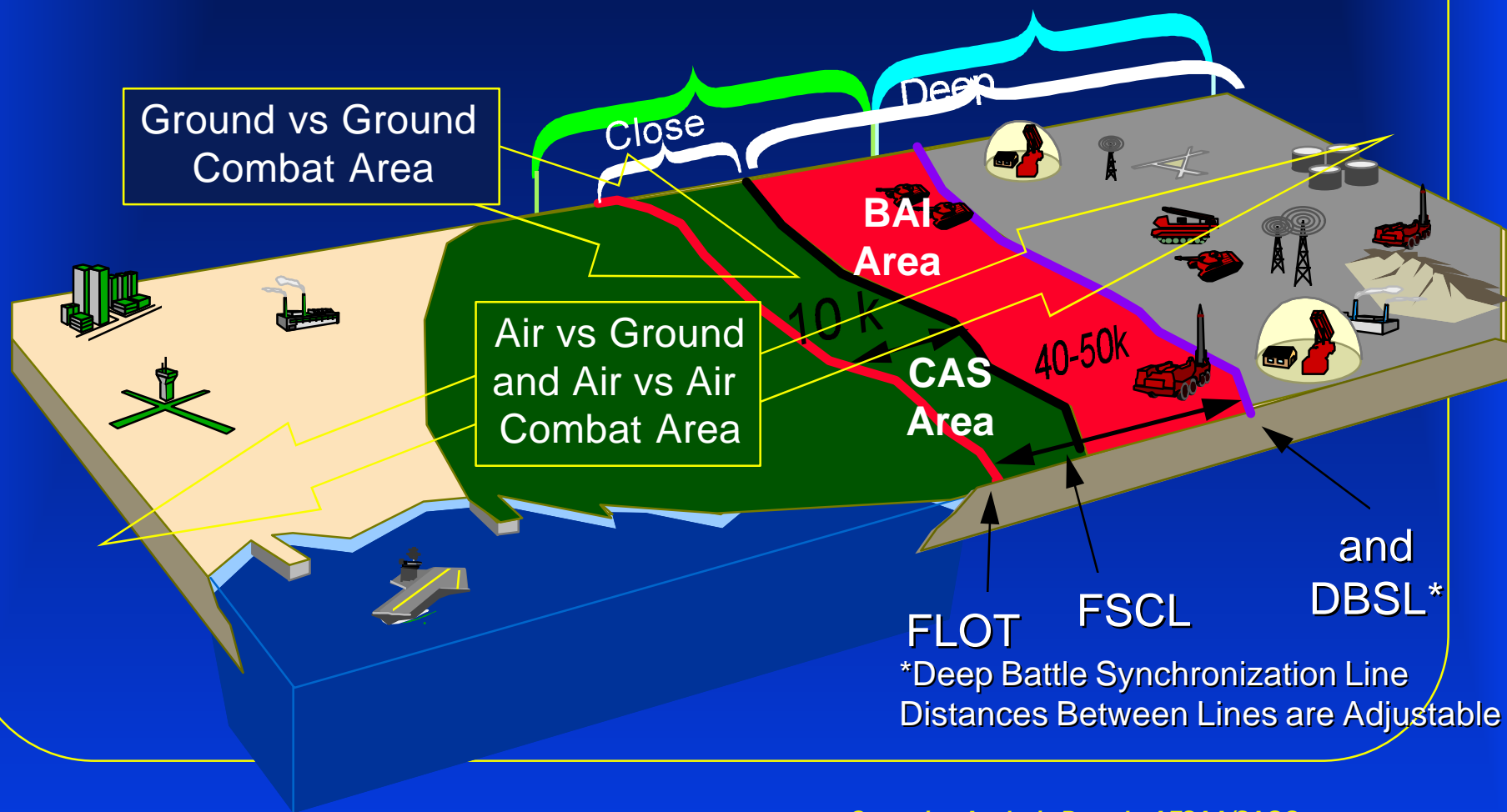


THUNDER Ground War

- **Based on US Army Concept and Analysis Agency's (CAA) Concept Evaluation Model (CEM)**
- **Ground vs Ground adjudication uses Attrition Calibration (ATCAL) methodology based on CAA's Combat Sample Generator (COSAGE) model**
- **Air war interacts with ground units**
 - **Directly -- shoot the tank**
 - **Indirectly -- drop bridge on ground unit's line of march**



Interactions of Air and Ground Forces





THUNDER Integrated Air Defense

- **IADS functionalities modeled:**
 - Detection
 - Identification (implicitly modeled)
 - Assignment
 - Destruction
- **Counter-IADS Tactics Available:**
 - Destruction
 - Disruption
 - Saturation
 - Intimidation



THUNDER Scenarios Currently Available

- **Southwest Asia--Iraq bad guy**
- **Northeast Asia--PDRK bad guy**
- **Generic Conflict Scenario (GCS)--Generic bad guy**
 - Europe with some countries cut off
 - Main playground in Hungarian Plain between Dinaric Alps and Carpathian Mountains
- **All scenarios “Data driven”**
 - Scenarios, force structure, terrain, and weapon systems described in data
 - Flexible--can be reconfigured easily--relatively little “hard wired” into model



THUNDER Inputs I

- **“Hard Data” -- bean counts and locations (lat/long) of “things”**
 - Air orders of battle
 - Ground orders of battle and unit TO&E's
 - Air defense/missile orders of battle
 - Infrastructure data such as:
 - » Logistics Facilities
 - » Transportation Network
 - » Communications nodes
 - Strategic targets
 - » Weapons R&D
 - » Electric power
 - » National C3



THUNDER Inputs II

- **“Soft Data” -- Strategy, operational art, tactics**
 - Flight tactics, escort ROE, support package makeup
 - Ground unit movement orders, defensive strength, offensive potential
 - Air defense fire doctrine, degraded modes
 - Repair and engineering data
- **Typically the most difficult to build**
- **Often subject to critiques from outside observers**



THUNDER Execution

- **Two modes of operation:**
 - **Analytic mode:**
 - » Run multiple repetitions
 - » Can run in parallel on multiple CPU machine
 - » Average results for output
 - **Wargame mode**
 - » Run single repetition using start/stop capabilities
- **Time compression:**
 - **Depends on complexity of scenario**
 - » SWA: 1 minute of run time for each day of war
 - » NEA/GCS: 2-4 minute of run time for each day of war



Typical THUNDER Outputs

- **Designed to compare combat outcomes for key operational objectives such as:**
 - Gain control of the air
 - Halt the invading army
 - Destroy enemy war supporting infrastructure
 - Destroy the occupying army
 - Eject the occupying army
 - Destroy enemy leadership
 - Destroy enemy infrastructure for reconstitution
 - Manage the cost of the campaign (losses)
- **Quantify weapon system contributions to these outcomes**



Types of THUNDER Outputs

- **Graphics**
 - Graphs
 - Situation Map
- **Reports**
 - Air-to-Air Encounters/Kills
 - Sfc-to-Air Encounters/Kills
 - Equipment Kills
 - Munitions Expenditures
 - Who shot John?



Conclusion

- **THUNDER large model**
 - Can do lots of things
 - Key to THUNDER use is limit scenario to appropriate level
- **THUNDER is flexible model**
- **Points of Contact: AFSAA/SAGC**

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